

Calendar of Events

THE MONTH OF MAY

[National Inventors Month](#)

TUESDAY, MAY 17

PPPL Colloquium

4:15 p.m. ♦ MBG Auditorium

[Functional capabilities and design of the ITER EC H&CD system](#)

Dr. Mark Henderson, ITER Organization

FRIDAY, MAY 20

DOE Secretary Ernest Moniz dedicates NSTX-U

2:30 p.m. ♦ MBG Auditorium

Staff will assemble for live streaming of the NSTX-U dedication followed by an all-hands meeting **at 3:15 p.m.** with DOE Secretary Ernest Moniz.

NSTX-U Dedication Reception

4:15 p.m. ♦ LSB Lobby

UPCOMING

FRIDAY, MAY 27

Princeton University Reunions Tours

10-11:30 a.m., 1:30-3 p.m.

BBQ Blues Jam

11:30 a.m.-1 p.m.

[See page 5 for details.](#)

JUNE 6-10

SULI program begins with one-week course for students

WEDNESDAY, JUNE 8

Inventor Recognition Dinner

6 p.m. ♦ Prospect House

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U.S. Secretary of Energy Moniz to dedicate NSTX-U May 20

By Jeanne Jackson DeVoe

U.S. Secretary of Energy Ernest Moniz will come to PPPL on Friday, May 20, to dedicate the \$94 million National Spherical Torus Experiment-Upgrade (NSTX-U) and hold an all-hands meeting with the staff.

U.S. Senator Cory Booker, (D-N.J.), U.S. Rep. Bonnie Watson Coleman (D-12), Princeton University President Christopher L. Eisgruber, and several other officials are expected to attend the event. Members of the media will be invited.

Moniz is expected to arrive at PPPL at 2 p.m. He, Booker, and other officials and members of the media will tour the NSTX-U test cell. The contingent will move to the control room where Moniz will unveil a plaque dedicating the NSTX-U. PPPL staff will gather in the MBG Auditorium at 2:30 p.m. to watch the live streaming of the dedication and remarks, followed by an all-hands meeting with Moniz at 3:15 p.m. There will be a Lab-wide reception with refreshments in the LSB lobby following the event at 4:15 p.m.

Stewart Prager, director of PPPL, said the Lab will show Secretary Moniz “our new experiment and discuss how important it could be for fusion energy and how it pushes the frontier of our understanding of plasma confinement science. It’s a chance for the staff to hear from the Secretary of Energy’s perspective on whatever he wants to communicate to us on energy or fusion, and that’s a great opportunity for us.”



Ernest Moniz

[continued on page 2](#)

PPPL scientist creates computer program that models lithium erosion in tokamaks

By Raphael Rosen

The world of fusion energy is a world of extremes. For instance, the center of the ultrahot plasma contained within the walls of doughnut-shaped fusion machines known as tokamaks can reach temperatures well above the 15 million degrees Celsius core of the sun. And even though the portion of the plasma closer to the tokamak’s inner walls is 10 to 20 times cooler, it still has enough energy to erode the layer of liquid lithium that may be used to coat components that face the plasma in future tokamaks. Scientists thus seek to know how to prevent hot plasma particles from eroding the protective lithium coating.

Physicist Tyler Abrams has led experiments on a facility in the Netherlands called Magnum-PSI that could provide an answer. The research, published in Nuclear Fusion in December 2015, found that combining lithium with the hydrogen isotope deuterium substantially reduced the erosion. Abrams conducted the research as a doctoral student in the Princeton Program in Plasma Physics substantially based at PPPL. He currently is a postdoctoral research fellow at General Atomics. The research was funded by the DOE Office of Science.

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NSTX-U dedication

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Moniz is the first secretary of energy to visit PPPL since 2010. The secretary of energy since 2013, he has taken a leading role in President Obama's climate change action plan and played a crucial role in negotiations with Iran for a comprehensive agreement on the Iranian nuclear program. Moniz is a nuclear physicist who was the Cecil and Ida Green Professor of Physics and Engineering Systems at the Massachusetts Institute of Technology (MIT) prior to his appointment. He held two previous posts in the U.S. Department of Energy during the Clinton Administration, as under secretary from 1997 to 2001 and as associate director in the Office of Science and Technology Policy in the Executive Office of the President from 1995 to 1997.

Prager said PPPL's leadership is grateful to the New Jersey delegation of U.S. legislators for their support. For example, U.S. Rep. Rodney Frelinghuysen (R-11), who visited the Laboratory recently, is "a very effective and eloquent champion of fusion energy and science in general," Prager said. He added that he and other Laboratory leaders are "delighted that Senator Booker and Congresswoman Bonnie Watson-Coleman will be here. They have also been very supportive."

The dedication will "celebrate the successful completion of a very successful and challenging construction project and the fact that we have begun our research activities on NSTX-U and we're happy that the facility has come up to speed so quickly," Prager said.

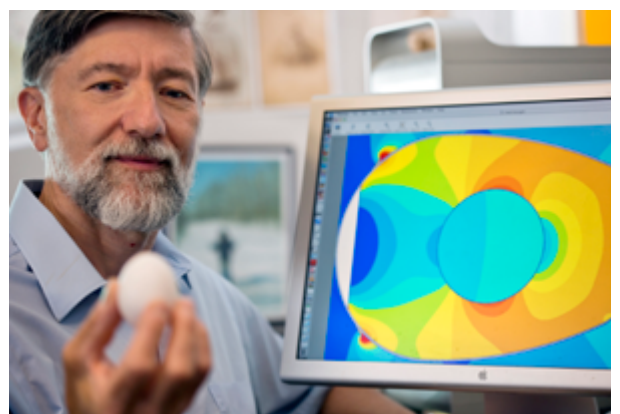
The NSTX-U is the largest facility of its kind in the world. It is a spherical tokamak, which is a cored apple shape in contrast with the standard doughnut-shaped tokamaks. The compact design could provide a more cost-efficient model for fusion power plants of the future. "It would be a monumental step for the fusion program if a decade from now we have the knowledge base to embark upon that," Prager said. The machine will also investigate whether liquid lithium could be a novel solution to the plasma material interface, he said. In addition, research from the NSTX-U will yield important contributions to ITER, the international fusion experiment in Cadarache, France, Prager said.

The PPPL staff has good reason to celebrate the successful construction and start-up of the NSTX-U, Prager said. More than half the staff of more than 500 people was involved in four years of construction. They managed to complete the project safely, on deadline, and under budget, Prager said. "The successful implementation spanned from engineers to technicians to procurement officials to safety experts," Prager said. "It was most dramatically an ensemble effort."

"It's a celebration," said John DeLooper, acting deputy director for operations, who is organizing much of the event. "It's a thank you. It's a recognition of everyone's hard work." 🍷

PPPL celebrates our inventors during National Inventors Month

PPPL congratulates Chris Brunkhorst for his invention of a device that uses a unique method to pasteurize eggs using radio frequency waves. Brunkhorst and co-inventors David Geveke, a research chemical engineer and lead scientist at the USDA Agricultural Research Service in Wyndmore, Pa., and Andrew Bigley, a retired engineering technician for the USDA, received a patent for their invention in 2014. The inventors won a 2015 Innovators Award from the New Jersey Inventors Hall of Fame.



**Do you have an idea that is novel, useful, and non-obvious?
Maybe you should file an Invention Disclosure Form!**

Contact Laurie Bagley, lbagley@pppl.gov ext. 2425.

Tyler Abrams

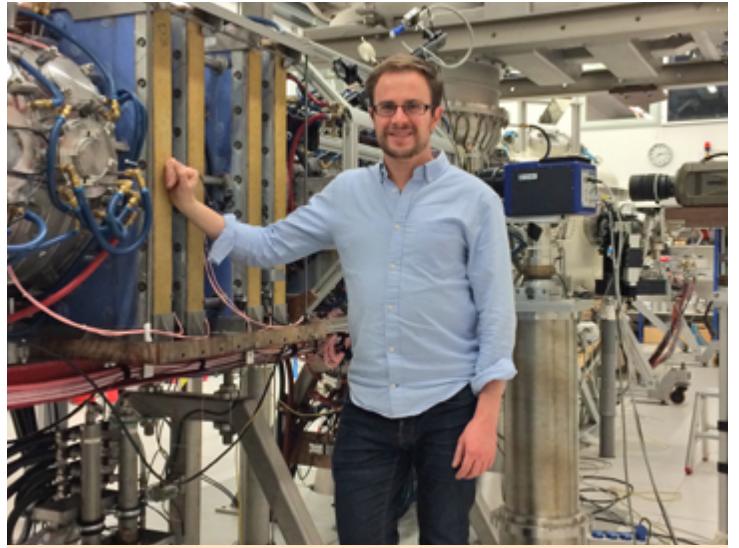
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“One potential issue with lithium is that it tends to erode off the chamber walls surfaces very quickly when it gets hot,” said Abrams. “In my research I was trying to determine exactly how much lithium actually comes off the wall under the conditions expected for fusion reactors.”

Physicists have long known that in fusion devices with low levels of plasma flux, meaning that the flow of charged particles within them is relatively small, the rate at which lithium eroded depends on the plasma’s temperature. Physicists had not, however, studied what would happen to lithium coatings in high-flux plasmas with a greater flow of particles. That increased flow will occur in future tokamaks. Scientists had thought that erosion would be greater in such machines.

But Abrams and the team found that the opposite was true while performing experiments at the Dutch Institute for Fundamental Energy Research. They found that the amount of lithium erosion in high-flux plasmas was much less than that in low-flux plasmas. The team conjectured that the difference stemmed from the chemical properties of lithium deuteride (LiD), a molecule created when deuterium atoms from plasma bond with the liquid lithium coating.

To test the conjecture, Abrams and his colleague, Dr. Mohan Chen, of Princeton University, created a computer program that modeled how deuterium combined with lithium. The new computer program indicated that the observed low rate of lithium erosion could stem from two factors. First, lithium deuteride molecules have a strong binding energy, meaning that incoming deuterium ions from the plasma have a hard time knocking lithium atoms loose from their bonds. Second, when deuterium ions in a plasma hit lithium deuteride molecules, they tend to knock the deuterium atoms out of the molecules and leave the lithium atoms in place.



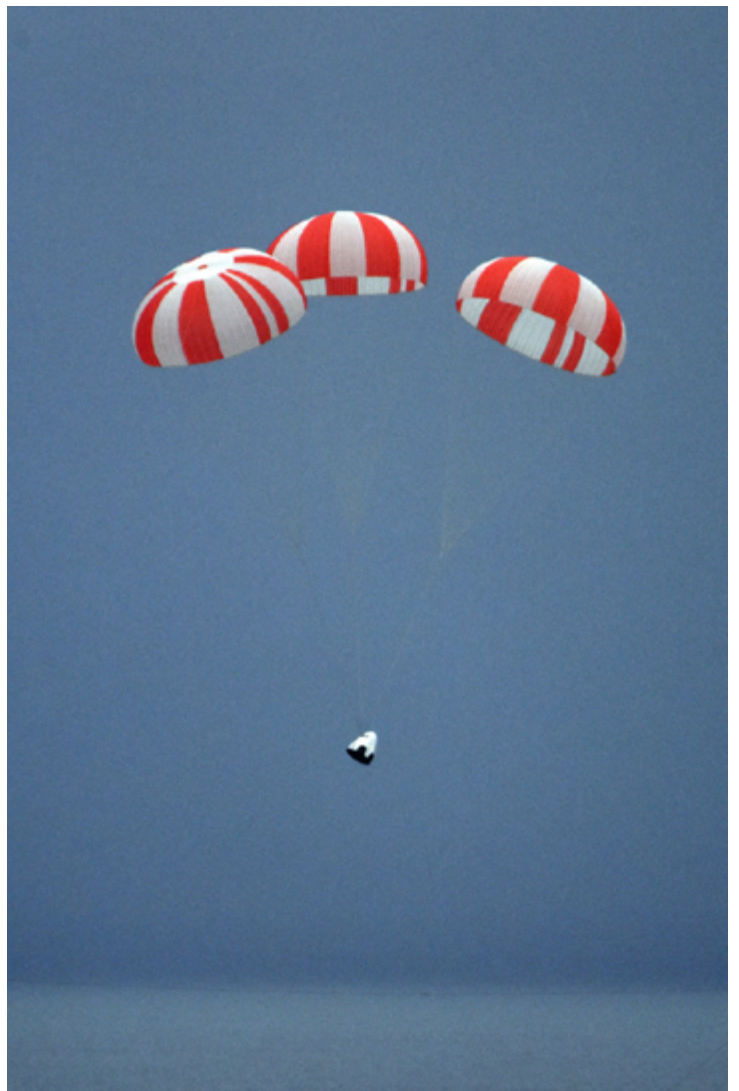
Physicist Tyler Abrams in front of the Magnum-PSI device at the Dutch Institute for Fundamental Energy Research. (Photo courtesy of Tyler Abrams)

Once the computer program had been completed, Abrams and the other scientists performed experiments on Magnum-PSI. They shot streams of plasma at samples of lithium that were placed inside the machine and recorded how much lithium came off. The amount of lithium that was eroded was similar to the amount predicted by Abrams’ model. In addition, the simulations showed that a layer composed of lithium deuteride would erode 20 times more slowly than would a layer of pure lithium.

“My results suggest that lithium is able to handle significantly higher amounts of plasma exposure and higher temperatures than others had previously expected,” said Abrams. “This suggests that liquid lithium will not erode too quickly if it is used on the walls of fusion reactors and will not contaminate the core plasma too much, making lithium coating a much more attractive alternative to solid metals walls.” 📧

Synthetic muscle experiment back on Earth after 13 months in space

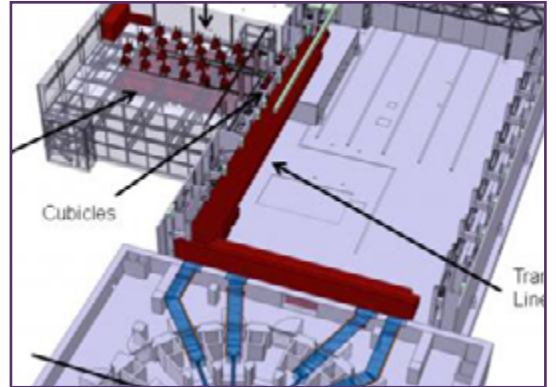
The SpaceX Dragon capsule carrying 4,300 pounds of supplies and payloads from the International Space Station lands in the Pacific Ocean off Long Beach, California on May 11 at 11:31 a.m. PT. Research experiments in the capsule include a synthetic muscle material developed by scientist Lenore Rasmussen with the help of PPPL scientists and engineers. (Photo courtesy of SpaceX). 📧



COLLOQUIUM

Functional capabilities and design of the ITER EC H&CD system

Dr. Mark Henderson
ITER Organization



Tuesday, May 17

4:15 p.m., M.B.G Auditorium, Lyman Spitzer Building

It's not too late to join the Federal Bike Challenge

May is National Bike Month and it's not too late to register for one of six PPPL bike teams [here](#). One of four team captains will contact you with registration information. Then all you have to do is log your cycling miles during May for all your bike rides at home and to work.



As of May 5, 46 people on six teams have registered for the Bike Challenge. The team captains are: Mike Zarnstorff, Dave Johnson, Daren Stotler, Larry Dudek, Theresa Gillars and Rob Sheneman.



Some members of PPPL's National Bike Challenge Team set off on a 10-mile lunchtime ride on May 12. From left to right: Rob Sheneman, Mark Karlik, Tony Bleach, Carol Ann Austin, Kenan Qu, Jake Maddox, and Andrei Khodak.

All-hands meeting with DOE Secretary Ernest Moniz May 20

PPPL staff will gather in the MBG Auditorium on **Friday, May 20, at 2:30 p.m.** to watch the NSTX-U dedication and remarks, followed by an all-hands meeting at **3:15 p.m.**

There will be a reception with refreshments at **4:15 p.m.** in the LSB Lobby.

ATTENTION ALL PPPL MUSICIANS

Sign up to Participate in PPPL's

SUMMER KICK OFF BBQ BUFFET BLUES JAM AND OPEN MIC LUNCH

Friday May 27, 2016

11:30 a.m.-1 p.m. in the Courtyard

PA system, Amps, Microphone & Backing Blues Tracks Provided.

Just Sign Up....Show Up...Plug In...Play

See Chef Mark in the Cafeteria to sign up or for more details or call extension 3350.

Robotics coaches needed for all-girls robotics teams

PPPL's Science Education team is looking for volunteer coaches for a new all-girls FIRST Lego League Robotics team (ages 9 to 13) and the new FIRST Tech Challenge Team (ages 13 to 18) being organized in collaboration with the YWCA-Princeton.

Please call Shannon Greco ASAP to volunteer:
sgreco@pppl.gov, 609-243-2208.

Save the date!

PPPL's Inventor Recognition Dinner will be held on Wednesday, June 8th, from 6–9 p.m. at Princeton University's Prospect House.

More information to follow!

If you have questions, please contact Laurie Bagley, x2425, lbagley@pppl.gov, or Susan Dever, x2245, sdever@pppl.gov.

BROCK

MARK GAZO
Chef Manager



BREAKFAST 7 a.m. • 10 a.m.
CONTINENTAL BREAKFAST 10 a.m. • 11:30 a.m.
LUNCH 11:30 a.m. • 1:30 p.m.
SNACK SERVICE until 2:30 p.m.

	Monday May 16	Tuesday May 17	Wednesday May 18	Thursday May 19	Friday May 20
COMMAND PERFORMANCE Chef's Feature	Inside Out Chicken Cordon Bleu served with Rice & Vegetable	Assorted Quiche served with Caesar Salad	Carved Grilled Eye Round Steak with Gravy, Mashed Potatoes & Vegetable	Kielbasa & Sauerkraut served with Potato Cheese Pierogies	LUNCH & A MOVIE— JULIE & JULIA Beef Bourguignon served with Garlic French Bread
Early Riser	Banana Chocolate Chip Pancakes	Cinnamon Raisin Pancakes with Housemade Apple Compote	Breakfast Tortilla with Ham, Green Onions & Cheddar Cheese Sauce	Corn Beef Hash with 2 Eggs any style	Italian Meat & Cheese Omelette topped with Wilted Spinach. Served with Home Fries
Country Kettle	Pasta Fagioli	Turkey Corn Chowder	Broccoli Cheddar	White Chicken Chili	White Bean Vegetable
Grille Special	BURGERLICIOUS The Simple Man Grilled Beef Burger with American Cheese, Tomatoes, Onions, Dill Pickle Chips, Shredded Lettuce & Secret Sauce on a Grilled Brioche Roll Served with Sweet Potato Fries	Hot Pastrami & Cheddar Cheese on French Bread	Fish & Chips Wrap with Tartar Sauce, Malt Vinegar and a Side of Slaw	Chicken Breast on a Kaiser Roll with Caramelized onions & Mushrooms with Pepper Jack Cheese	Potato Pancakes served with Sour Cream & Apple Sauce
Deli Special	Hummus, Avocado, Roasted Peppers, Feta Cheese & Fresh Basil in a Wheat Wrap served with Maple Glazed Pears	Roast Beef & Swiss Club Sandwich with Bacon on Choice of Bread	Smoked Beef Brisket on an Onion Roll	Popcorn Chicken Po' Boy	Smoked Turkey & Swiss Cheese on French Bread with Lettuce & Tomato
Panini	Meatball Torpedo with Peppers, Onions, Pepperoni & Provolone	Sicilian Grilled Chicken Panini with Orange Balsamic Dressing, Spinach, Fresh Mozzarella Bruschetta on an Asiago Roll	Turkey & Stuffing Wrap served with Gravy and a side of Fries	Veggie Burger with Guacamole, Tomato, Cilantro, Red Onion & Salsa on a Kaiser Roll	Latin-Grilled Mango Chicken with Mango Chutney, Salsa, Cheddar Cheese & Spring Mix on Ciabatta Bread

MENU SUBJECT TO CHANGE WITHOUT NOTICE

VEGETARIAN OPTION

WEEKLY

Editor: **Jeanne Jackson DeVoe** ♦ Layout and graphic design: **Kyle Palmer** ♦ Photography: **Elle Starkman**
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The PPPL WEEKLY is published by the [PPPL Office of Communications](#) on Mondays throughout the year except for holidays.

DEADLINE for calendar item submissions is noon on WEDNESDAY. Other stories should be submitted no later than noon on TUESDAY.

Comments: commteam@pppl.gov ♦ PPPL WEEKLY is archived on the web at: <http://w3.pppl.gov/communications/weekly/>.